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CHLORINE TASTES AND ODORS FROM PIPE COATING¹

By E. J. ROWE²

I was very much interested in the article by C. A. Hechmer on the probable formation of phenolic compounds by a chlorinated water in contact with a coal tar paint.³

During the past three months I had a similar experience, and had drawn a similar conclusion, yet have been afraid to mention the same for fear of ridicule.

We put a million gallon rapid sand filter plant into operation the first of December, 1921. Owing to the lack of proper chlorine control equipment, a home-made device was used for about two weeks, consisting of a needle valve on the chlorine tank to control the feed. The chlorine passed through a rubber tube to a large and heavy wash bottle having a two-hole rubber stopper in the top, glass tubes were put through the stopper, one with the end restricted to a very small opening and long enough to reach nearly the bottom of the bottle for the chlorine and the other, much larger, connected to a clear water supply just long enough to enter the bottle through the stopper. The resulting solution was fed out through the side neck to a rubber tube extending to the bottom of the clear well ending in a large pan of very fine sand to act as a diffuser. This equipment was original with the writer and was in use at our slow sand filters for about four months. We were able to secure remarkable control in this manner, after a bit of experimenting to secure the proper adjustment of the needle valve. The chlorine would issue in small bubbles from the longer tube in plain sight. Our records show that less than $\frac{1}{16}$ pound

¹ The Editor calls particular attention to the above contribution as an example of the type of important material which frequently never sees the light of day. The author confesses his fear of ridicule, but at least in this instance he overcomes his diffidence. It is hoped that this paper will serve as a beacon to many water works superintendents who hide their "lights under a bushel" and will serve to elicit many contributions of data which have a value too often minimized by their collectors or originators.

² Superintendent, Water and Light Department Wellsville, New York.

³ See JOURNAL, March, 1922, page 319.

variation of chlorine fed from day to day, when applying 3 to $3\frac{1}{2}$ pounds per day, determined by weighing the drum twice a day.

After the expiration of the above two weeks, proper equipment was installed to apply the chlorine.

When the complaints about the use of chlorine were being received the first two weeks, the writer attributed them to the crude method of applying the chlorine and let it go at that, but after a one-week trial with proper equipment, using a dose not to exceed 0.3 p.p.m., the complaints of chlorine tastes could be heard 16 miles southwest of Havana.

The point of application of chlorine was then changed to a point between the sedimentation basin and the filters. This did not correct the trouble, or rather stop the complaints. The writer then attributed the complaints to organic compounds or deposits that had been accumulating in the system during the past thirty years, emphasized, no doubt, by the somewhat liberal dosage of chlorine and the flushing of the hydrants. The somewhat unusual point, however, regarding the complaints was the fact that it (the "chlorine ghost") showed up in spots around the system. This system is well designed to give the greatest possible circulation with no dead ends that could be avoided. The writer lives at such a point that practically all the water used must pass his residence before reaching the major portion of the town, yet at his residence he could detect no trace of excess chlorine, except on two different occasions, about five weeks apart. In following up the "chlorine ghost" it would seem to be no respector of either rapid or slow circulation of the water in the mains. Apparently the taste travelled in slugs, as in several cases the objectionable taste and odor would disappear within an hour or two. Several times the writer made special trips in response to telephone calls only to find that the "ghost" had faded away before his arrival. This happened several times when the calls had come from reliable parties. Is it any wonder the writer called it the "chlorine ghost"?

When it was run into a corner and finally captured, the writer found, not the characteristic chlorine odor and taste, but "one closely resembling that of iodoform and the taste approached that of carbolic acid" (if I may be permitted to quote the article mentioned).

This fact had the writer puzzled until a few days later, about January 20, when, in making an inspection of the discharge end of the force main (12-inch C. I. pipe from the filters to the storage basin) he noticed a deposit of brownish black flakes, somewhat similar to

flakes of iron rust. Upon picking up a handful the "chlorine ghost" odor was very marked.

A sample of this deposit was taken to the laboratory and studied. The writer concluded it was the coating from the pipe which had been laid about seven years previously, as a sample taken from the coating of the piping system of the new filter plant would not give the same reactions as from the older pipes. It had all the characteristics of a phenol compound combined with iron. The sample of the deposit was treated as follows (simply because the writer didn't know of any other method to test the stuff). A flake was placed in six flasks and about 100 cc. of distilled water was added. The flasks were then placed, two in the 37° incubator, two on a bench in the laboratory, two in a cold water bath, the temperature of the same being about $\frac{1}{4}$ to $1\frac{1}{2}$ °C., resulting in no perceptible taste or odor after three days. At the end of this period one drop of a saturated solution of chlorinated lime was added to one of each pair of flasks, when the odor of iodoform was noticed in about two hours (may have developed earlier) in the flask at 37°, no odor at lower temperature, this odor disappearing within six hours or just about the time it appeared at the lower temperature. The odor persisted at the lowest temperature for more or less than a day, while the taste remained after the disappearance of the odor for over twenty-four hours. The samples not treated with chlorine showed no deposits, odor or taste after two weeks. The sample at 37° was kept in the incubator until all the water had evaporated. The flake was re-treated with distilled water and returned to the incubator for four hours. No taste or odor developed. When placed in a cold water bath, no taste or odor resulted within four hours, but upon adding an additional drop of chlorine solution about $\frac{1}{10}$ the strength of first solution, the odor and taste of the "chlorine ghost" were very pronounced after four hours.

The only suggestion that the writer can offer is that the chlorinated water standing in this force main (the plant being in operation about twelve hours a day) caused a formation of some phenolic compound which required a time element to form. From the experiments this period seems to be from one to six hours. It is suggested that it would be worth while to investigate the question of pipe paints or coatings, especially when used to convey chlorinated water, as three months use of this particular pipe line has not neutralized this objectionable feature. Any dosage above 0.3 p.p.m. will cause the appearance of the chlorine taste even when it is impossible to detect any excess chlorine.